January 2011

Automation and Integration for Bioreactors, Laboratories and Manufacturing

Vertical Solutions

ILS Automation solutions encompass data acquisition and hardware controllers to software for supervisory control, historical data management, and reporting. ILS understands its customer needs are unique. ILS provides the expertise and support to deliver solutions in a timely and professional manner.

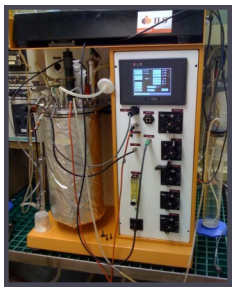
ILS specializes in bioreactor data management, laboratory, and manufacturing processes. Our vision is the integration of hardware with the expertise of scientists and engineers to create system to monitor and control processes in a more efficient and productive manner.

ILS has engineered the AFC line of bioreactor controllers for bench-top to SIP/CIP reactors. ILS solutions work not only with new reactors but our specialty is the integration of used or new-used reactors.

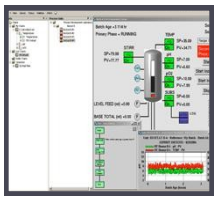
ILS software solutions include Batch Expert and ILS Automation Expert. Batch Expert is designed for batch process development. ILS Automation Expert is designed for laboratory, manufacturing or general automation. ILS solutions offer superior value than that of comparable SCADA/HMI or vendor specific packages.

ILS software is a rule-based, real-time, object oriented, interpretive environment. This allows our solutions to easily integrate specific customer needs (object- oriented) and knowledge (rule-based). To reduce downtime and improve productivity, the system allows for online development and maintenance.

In addition, ILS systems offer a superior development environments for hardware/ instrumentation integration, charting, supervisory & PID control, recipe-based control, data historian, and HMI. Lastly, ILS offers attractive pricing.



AFC 901 with ISM Optical DO and ISM pH



ILS BE Software for Supervisory Control, Data Acquisition and

Inside:

Mettler Toledo ISM Probe Integration

The ILS AFC line of controllers directly integrate the Mettler-Toledo ISM probes. Intelligent Sensor Management (ISM) is the technology end-users expect in the contemporary environment of devices such as smart phones.

The ISM probes are all digital with built-in transmitters and processing that provide more and better data. ILS AFC systems integrate, record, and report this data. Users can track the serial # of probes and the health of probes over time. Think preventive maintenance to reduce probe cost and lost batch cost. Probes offer temperature compensation and built-in transmitters reduce the influence of noise and ground loops.

ILS Batch Expert Software

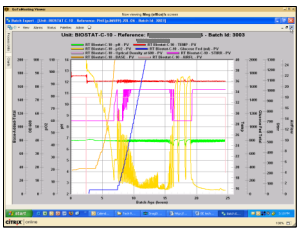
Batch Expert is a powerful, enterprise SCADA system designed for batch control and batch data management in process development and pilot-scale environments.

As an industrial-grade automation platform, Batch Expert is robust and maximizes available development time and resources.

Value Added Features

Robust control and data acquisition in the Laboratory/Pilot Plant environment

- Multiple data source integration including reactor vendors, instruments, etc.
- Direct interface for Sartorius, NBS, Applikon, ILS AFC, etc.
- Multiple software interfaces — OPC, ODBC, DDE, RS232/422/485
- Recipe and event based control
- PID control
- Audible and email based alarms
- SQL based data historian and off-line data entry
- Data visualization and reporting
- Online remote support and development
- Object-oriented programming environment facilitates custom needs



Integration and Flexibility

ILS software solutions include a real-time, object oriented programming environment that is available to the end-user. The environment is extremely efficient and facilitates value-added development and support of specific customer requirements.

This environment is specifically designed to implement and execute rule-based or event-based control in real-time. This is well suited to bioreactors where many control and monitoring strategies are heuristic in nature (ph-stat, DO-stat).

Value Added Application

- Ability to add new equipment and instrument interfaces as they become available
- Ability to quickly implement custom control strategies, process monitoring, and real-time calculations
- Custom graphical user interfaces (GUI)
- Ability to program tasks outside the context of batch control

> "We were able to easily automate our feed strategies for pichia, including mass-spec MeOH feedback and exponential feeding"

Remote Support Capabilities

The ILS software environment also allows for online editing, development, and support. This greatly increases uptime and capital utilization by allowing changes without interrupting online operation. End-users and ILS support engineers can monitor, develop and debug processes while they operate.

ILS offers remote support through web-based meetings and/or VPN access. This is especially productive and affordable means to develop and deploy new functionality greatly reducing the cost and delay of onsite travel.

ILS engineering skills include electrical engineering/control panel design, software engineering and process/batch control.

GoToMeeting®

VPN

ILS utilizes a web based meeting such as GoToMeeting or VPN access to facilitate remote support.

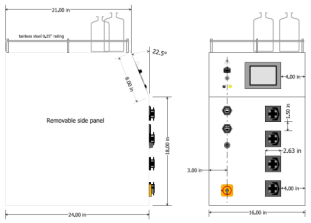
AFC Bioreactor Controllers

ILS offers the AFC bioreactor controllers for existing new or used reactors. Today ILS provides controllers that work with bench-top glass reactors to stainless steel SIP/CIP reactors. ILS systems work with jacketed reactors that require a 'water-box' for heating/cooling or reactors that have only a heating blanket.

ILS offers flexible solutions and can customize the controller to work with existing steel SIP/CIP reactors. ILS can provide complete engineering services including P&ID, function requirement, design and test, control panel design and manufacturing, and software integration. The system can integrate a variety of gas flow controllers (GFC), scales, analog inputs/outputs, digital or serial RS232/485, Mettler Toledo ISM probes, etc. into an OPC compliant industrial grade system.

Value Added Features

- Open system utilizing industrial grade components such as PLC, HMI, OPC.
- Works with a variety of vessels from a variety of vendors.
- Supports glass-jacketed reactors with a separate ILS 'water-box' for heating/cooling. Also supports heating blankets for heat only rectors.
- Supports stainless steel SIP/CIP reactors.
- Easily integrates, through OPC, to ILS Batch Expert software.
- PID control for temperature, DO, pH, etc. PID control strategies are configurable based upon the process.



AFC 100, 900 and 1000 Controller

AFC 100 Bioreactor Controller

The AFC 100 is a value-based approach to bioreactor control that is especially suited for processes that do not require a water-jacket and have fixed agitation RPM. The AFC 100 is considered a remote terminal unit (RTU) for pH, temperature and dissolved oxygen. The system supports 3 analog outputs to control variable speed pumps, agitators, gas flow controllers (GFC) and 3 relay outputs to control fixed speed pumps, heaters, and valves. The actual control is performed by external software such as ILS Batch Expert through a Modbus interface.

The AFC 100 targets DIY users who wish to put together their own system including vessel, pumps, GFC. The AFC 100 offers an affordable yet fully functional entry point. The footprint of the AFC 100 is very small a well suited to setups where space utilization is a key factor.

ILS AFC 100 in combination with ILS Batch Expert software provides an affordable yet fully functional entry point

AFC 900 Bioreactor Controller

The AFC 900 series bioreactor controller is a complete turn-key solution for bench-top glass bioreactors. The system is a stand-alone controller that includes an Ethernet port for remote OPC data communication. The base system includes variables speed and fixed peristaltic pumps, GFCs, temperature/pH/DO control, and motor controller. Instrument ports include temperature (PT100), pH, dissolved oxygen and foam. In addition, the system can come with Mettler-Toledo ISM connections for pH, polarographic DO, and optical DO. The system also supports digital serial connections (RS232/485) to scales and other devices

The AFC 900 can work with reactors from a variety of vendors including but not limited to New Brunswick, Applikon, Sartorius, or home-built (DIY) reactors. The system supports OPC for remote data acquisition and control from the ILS Batch Expert platform.

ILS AFC 900 is a turnkey solution for bench-top glass reactors

AFC 1000 Bioreactor Controller

The AFC 1000 is intended for stainless SIP/CIP reactors from laboratory to pilot-scale. These steel reactors useful lifetime is often much longer than that of its original controller. ILS offers the AFC 1000 to control such reactors. ILS will work with end-users to develop a process and instrumentation diagram (P&ID) of the existing system. From this diagram, a requirement, design, and test specification are presented to the end-user for final approval. ILS will manufacture, install, and support the final controller (control panel).

The AFC 1000 can include a variety of options including the ability to integrate numerous analog and digital serial interface, PID control loops, sequential steps for SIP/CIP, and digital on/off IO. The system can support the Mettler Toledo ISM Probes, OPC, multiple GFCs, scales, etc.

ILS experience with developing and delivering such systems reduces the time and cost. Since most SIP/CIP reactors will share the majority functionality, ILS can deliver fast and efficient solutions.

Mettler Toledo ISM Probe Integration

ILS directly integrates with the Mettler-Toledo ISM pH, polarographic DO, and optical DO probes. ILS communicates to the probes through a digital, serial interface. ILS is able to address multiple probes on a single serial interface.

Future Features

- Built-in transmitter and digital conversion reduces noise interference and likelihood of ground loops.
- Track and present probe health to the end-user. For example, show a trend of probe health over time.
- Probe offers more information which translates into more accurate measurements e.g. built-in temperature compensation, ORP included, etc.
- Serial # tracking in the external SQL database
- Track hours of use, reactor assignment, SIP cycles, etc. Present charts showing health versus these values.
- Display reports showing which reactors have been used which probes.
- Since data is available in corporate SQL database then end-user can design their own reports and metrics.

Example of ILS Customer

A natural food technology company relies on product development that does not allow for any genetic modification. Such an approach places an emphasis on performing rapid and reliable process development. To meet their needs ILS provides the AFC 900 bioreactor retrofit of their favored reactors.

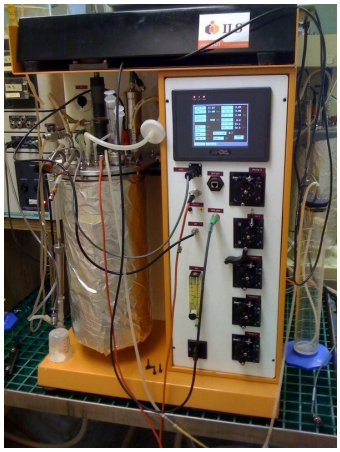
The system had to provide modern controls and data access including a higher power agitator motor, new cooling water loop, updated PID control, GFC, Mettler Toledo ISM Optical DO, variable RPM pumps and OPC for data access.

From experience, a heuristic or rule-based approach to substrate feed had been developed. This approach relied upon pH and DO measurements. To maximize the reliability and productivity of the feed strategy ILS provided the AFC 900 with a variable RPM pump and direct interface to Mettler Toledo ISM Optical DO probe.

Batch Expert controls substrate feed based upon DO% and pH levels. The controller is based upon heuristics and implemented in real-time within Batch Expert. The system also monitors the process for any deviations from typical operation including temperature, pH, DO and feed rates. Any alarm conditions are presented through both audible alarms and email messages. Operators can remotely access Batch Expert through a VPN connection. Operators can change or adjust the feed strategy without interrupting the operation of the process.

The AFC 900 direct interface to the Mettler Toledo optical DO provides operational advantages. The probe exhibits a higher reliability and accuracy compared to polarographic DO probes. In addition, the probes payback has been realized in the robustness and ruggedness over many autoclave cycles as compared to polarographic DO probes.

The AFC 900 interface to the ISM probes is unique. ILS utilizes a direct digital interface that provides complete access and control of the probe. The full value of the ISM probes can be realized with ILS solutions.



Intelligent Laboratory Solutions, Inc. (ILS)
P.O. Box 1309
Warrenville, IL 60555 USA

Phone: 847-922-0891
Fax: 630-357-9512
E-mail: info@chromsmart.com

http://www.ils-automation.com

ILS has been providing automation and software solutions since 2001. Our expertise started with real-time, rule-based systems for laboratory, batch, manufacturing and business applications. ILS saw the need to integrate laboratory and hardware control systems with SCADA software and databases. With our background in process control and software we have extended our products and services to control hardware, with the emphasis in easy, robust and affordable integration with software and enterprises.

- Automation and Integration for Bioreactors, Laboratories and Manufacturing

Rule and Event-Based Real-Time Systems

ILS has the unique experience of deploying real-time, rule-based systems for a variety of processes from manufacturing/laboratory to business system. Rule-based system are common place today with many users unaware that they are even interacting with such technology.

In manufacturing rule-based system are often utilized in applications that value heuristics. Examples include process monitoring or preventive maintenance, scheduling and packaging, and batch control of biological and polymer processes.

ILS offers the ChromSmart software for rule-based laboratory automation and data analysis. Laboratory applications utilize rule-based system to improve productivity of high-throughput screening and sample tracking. Such system can apply rules to large datasets providing promising paths for further processing or investigation.

Business system are widespread and range from financial transactions, consumer marketing, scheduling, packaging, etc. Real-time heuristics has the ability to apply and analyze a set of rules or assumptions on incoming and historical data. Applications may improve productivity, reduce volatility, or reduce risk. The analysis of heuristics over time tests hypotheses and improves the understanding of the process.

ILS has applied such system to batch process systems. In particular, ILS software solutions incorporate real-time rules. Our end-user perceive this value through increased productivity and tighter control of their processes.